



United States
Environmental Protection
Agency

Innovations

in Research at EPA

**Office of Research
and Development**



The U.S. Environmental Protection Agency (EPA) relies on sound science to safeguard both human health and the environment. The Office of Research and Development (ORD) is the scientific research arm of EPA.

ORD's leading-edge research helps provide the solid underpinning of science and technology for the Agency.

ORD conducts research on ways to prevent pollution, protect human health, and reduce risk. The work at ORD laboratories, research centers, and offices across the country helps improve the quality of air, water, soil, and the way we use resources. Applied science at ORD builds our understanding of how to protect and enhance the relationship between humans and the ecosystems of Earth.

ORD Mission

- Perform research and development to identify, understand, and solve current and future environmental problems.
- Provide responsive technical support to EPA's mission.
- Integrate the work of ORD's scientific partners (other agencies, nations, private sector organizations, and academia).
- Provide leadership in addressing emerging environmental issues and in advancing the science and technology of risk assessment and risk management.

As part of our mission, ORD has identified eight research areas considered as highest priority. They are:

- Air
- Drinking Water
- Ecosystem Assessment and Restoration
- Global Change
- Human Health Protection
- Water Quality
- Pollution Prevention and New Technologies
- Endocrine Disrupting Chemicals (EDCs)

*For more information on these priority areas please visit
www.epa.gov/osp/myp.htm*



Air

Although much progress has been made in recent years, air pollution continues to be a widespread human health problem in the United States.

EPA's air quality program aims to ensure that the air in every American community is safe and healthy to breathe.

ORD's air research program provides the scientific foundation for EPA's air quality regulations for particulate matter, ground-level ozone, carbon monoxide, sulfur dioxide, nitrogen oxides, and lead.

In addition, ORD conducts research to help understand and manage the risks for these compounds. We also do research and assessments on hazardous air pollutants that may be harmful to people. As part of this work, ORD addresses the potential effects of these compounds on susceptible populations such as children, the elderly, and people with respiratory illnesses. The air research program includes clinical and laboratory studies, epidemiologic studies, air quality model development, characterization of emission sources, and control technologies.





Drinking Water

The American public enjoys safe drinking water. In the United States, utilities and other providers select the best water sources, treat water to control contaminants, and maintain sound water distribution systems. Waterborne threats such as typhoid fever and cholera have been virtually eliminated. However, some public health concerns remain from pathogens and chemical contaminants.

Research provides a strong scientific foundation for EPA decisions that help protect the public from drinking water contamination. ORD's research program focuses on both surface water and groundwater. These sources can be contaminated with many different chemicals, including natural substances such as arsenic and man-made compounds like pesticides. Furthermore, the process of disinfecting water itself creates a number of potentially toxic chemical byproducts. This research is especially significant to infants, children, and people with weakened immune systems who are particularly sensitive to some waterborne contaminants.



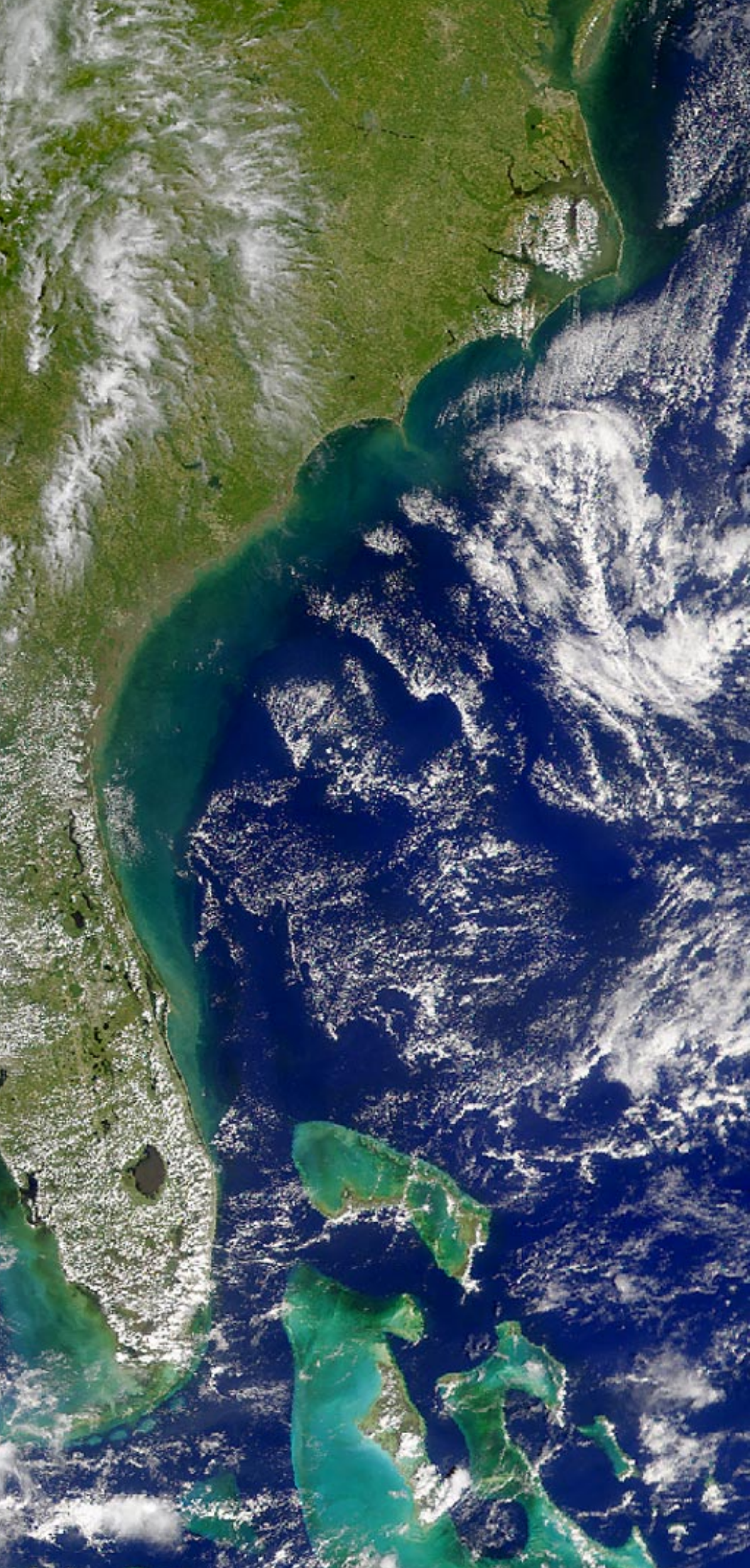


Ecosystem Assessment and Restoration

Healthy ecosystems are a complex and delicate balance of living things and their environment. Robust, sustainable ecosystems can involve plants, animals, people, soil, water, energy, and nutrients. When this balance is disturbed by contaminants, human activity, or invasive species, the ecosystem is threatened.

ORD's ecosystem assessment and restoration research program provides information to understand the scale of a problem within a threatened ecosystem, need for action, causes of harm, and success of mitigation and restoration efforts. We use highly sophisticated computer models to help interpret data on the causes of ecological degradation. To quantify the risks to ecosystems, ORD scientists develop and use advanced risk assessment techniques. This research helps to design cost-effective protection and restoration strategies.





Global Change

Global change can have local impact. Even slight shifts in temperature, water currents, forests, and atmospheric gases—whether the result of human activity or natural trends—can have far-reaching effects.

The U.S. Global Change Research Program is an integrated, multi-agency effort that helps the world understand, assess, predict, and respond to global change. ORD is one of more than 10 federal entities participating in this program.



The research program is assessment-oriented. It focuses on the potential consequences of climate variability and climate change on human health, air quality, water quality, and ecosystem health. ORD investigates the influence of human activities in global climate change, as well as adaptation options that can build resilience to change.



Human Health Protection

Environmental pollution poses potential risks to the general public. Part of assessing those risks is to address how they affect the most vulnerable groups among us, such as children and communities that rely heavily on subsistence fishing, hunting, and farming. ORD conducts human health risk assessment research to assess and characterize more accurately hazards to humans from exposure to pollutants.

ORD leads research efforts to ensure that pesticide residues on food do not pose a health hazard. Other areas of research focus on how chemicals and pesticides are absorbed through the skin, ingested, or inhaled. A major component of this research is understanding how these compounds travel through air and water and cause potentially harmful exposure to humans. The result of this research is one piece of the puzzle that provides scientifically defensible information for the Agency's decision-making process.





Water Quality

The quality of the nation's freshwater resources is vital to the ecology, human health, and the economy. By investigating ways to clean up contaminated waterways, sites, and groundwater, ORD scientists are working to preserve and restore the quality of our water resources.

Water quality research provides the tools and techniques used by the EPA's Office of Water to protect the nation's freshwater and coastal resources. ORD's research assesses damage to aquatic systems and identifies sources of that damage. The research also helps forecast the ecological, human health, and economic outcomes of the possible solutions to water quality problems.

Because the sources of contamination are as important as its effects, ORD also investigates methods to clean up contaminated groundwater and sediments.





Pollution Prevention and New Technologies

EPA recognizes that pollution prevention, rather than remediation, is the optimal solution to environmental problems. ORD fosters innovative design and production techniques to minimize or eliminate industrial waste. This helps create fundamental changes in the production and delivery systems that move goods and services to the American consumer and develops sustainable approaches for using natural resources. ORD also supports programs to develop new technologies to clean up contaminated sites.

Working with industry, universities, and other agencies, ORD tests commercial-ready technologies developed to prevent or solve environmental problems. Examples include nonpolluting metal finishing processes, inexpensive ways to produce polymers using less hazardous solvents, and methods to remove chlorinated solvents from contaminated groundwater. Cleaning up Superfund sites using innovative technologies evaluated under this strategy has saved billions of dollars.





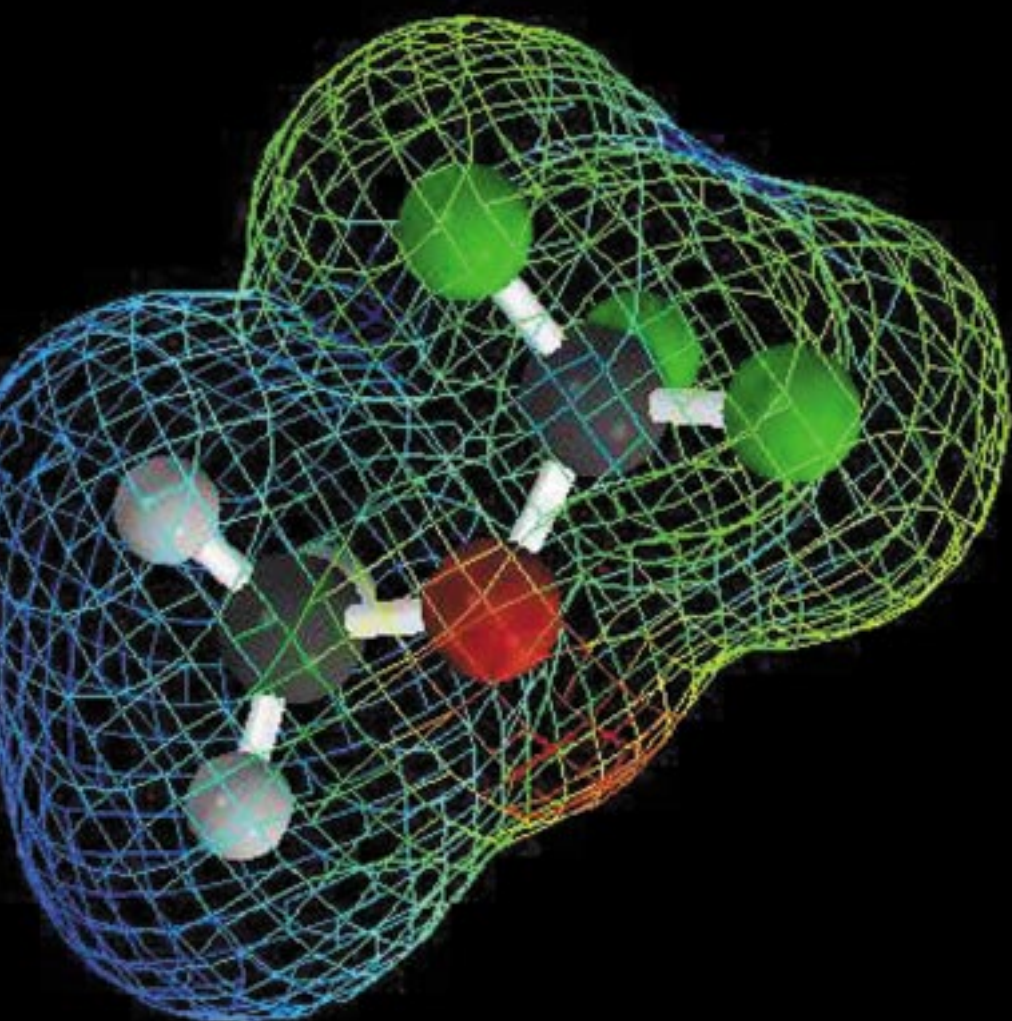
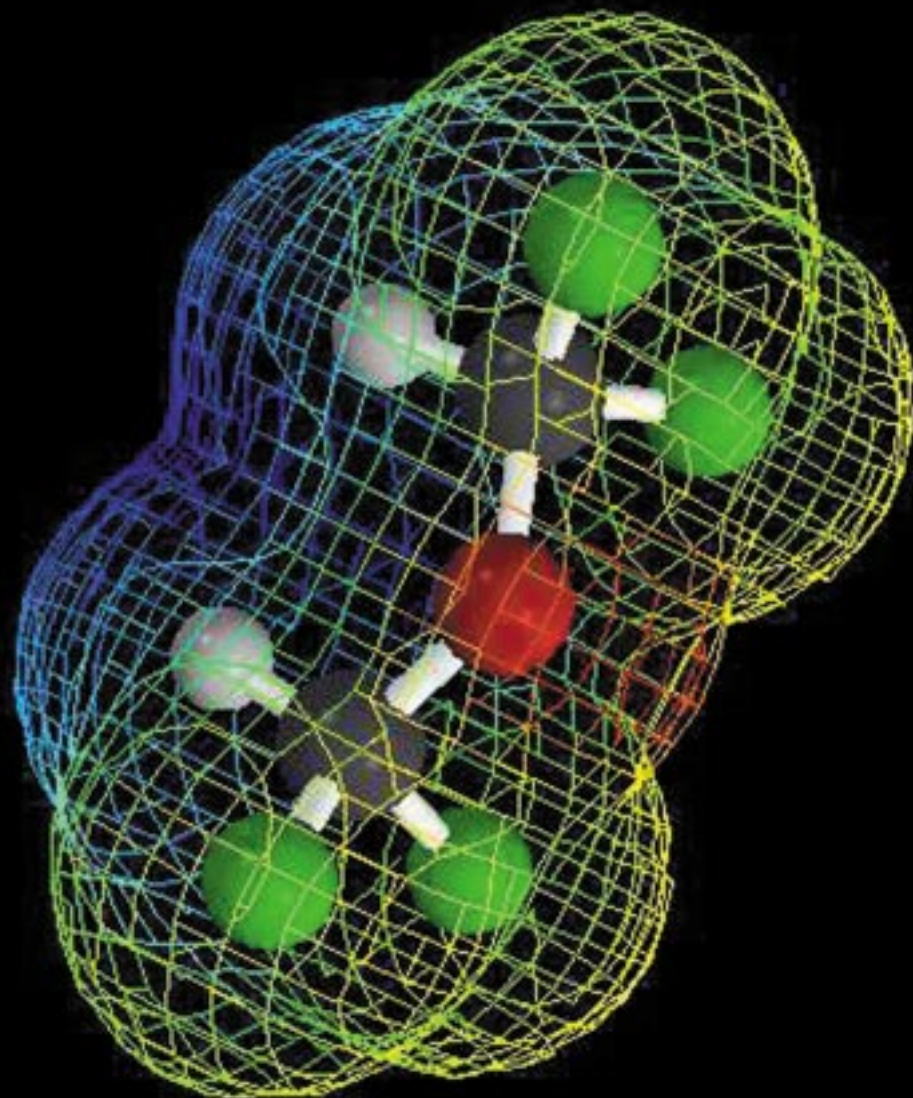
Endocrine Disrupting Chemicals (EDCs)

In the last decade, the scientific community has become increasingly concerned that humans and wildlife are harmed by exposure to chemicals that interact with the endocrine (hormonal) system. Chemicals that interfere with the body's natural hormones are called endocrine disrupting chemicals (EDCs). A broad range of environmental contaminants, including some pesticides and industrial chemicals, are either known or suspected EDCs.

ORD scientists are developing methods to detect the endocrine disrupting activity of pesticides and industrial chemicals. ORD is developing computer-based tools for predicting a chemical's endocrine activity based on its molecular structure.

Using innovative research methods, investigators are studying the magnitude of effects of, and sources and levels of exposures to, EDCs in humans and a variety of wildlife species. Engineers are developing approaches for reducing exposures to EDCs from certain sources, such as sewage treatment effluents and contaminated sediments.

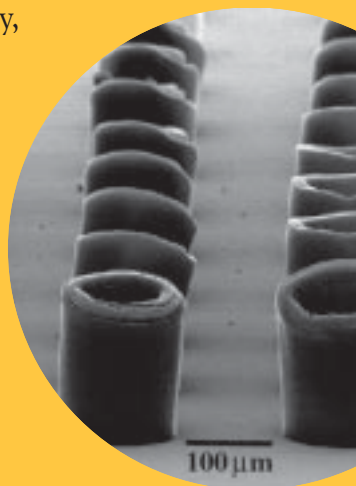




Future Research Directions

Rapid developments in science and technology present us with opportunities to develop innovative solutions to environmental problems. Looking to the future for trends that may harm human health and the environment is critical to setting future research directions. In ORD, foresight techniques are used to plan research strategically by identifying potential issues before they lead to environmental damage.

Nanotechnology, computational toxicology, biotechnology, information technology, and genomics are just a few of the innovative areas of science that EPA is exploring both for their benefits and potential unintended consequences.



For example, ORD is working with its scientific partners to examine the environmental benefits of nano-based materials. Nanotechnology, the science of designing materials at the molecular level, offers environmental benefits that range from designing cleaner manufacturing processes that minimize waste and reduce pollutants to new methods for detecting and cleaning up environmental hazards.



RESEARCH LABORATORIES AND CENTERS

ORD is organized into three national laboratories, three national centers, and two offices located in 14 facilities around the country and in Washington, DC. These labs, centers, and offices provide information and technical support to EPA program offices, regions, state/municipal/tribal governments, and other agencies performing environmental research, assessment, and risk management. ORD scientists also collaborate with private-sector partners to address important environmental issues.

www.epa.gov/ord

The National Exposure Research Laboratory (NERL) provides information to increase the accuracy of EPA's exposure and risk assessments for factors that stress the environment, including chemicals, living organisms, radiation, changes in land and water use, and changes in climate. NERL also evaluates innovative technologies to improve exposure assessment and provides information on stressor sources, pollutant transport and fate, and human exposure to pollutants.

www.epa.gov/nerl

The National Health and Environmental Effects Research Laboratory (NHEERL) is EPA's focal point for scientific research on the effects of contaminants and environmental stressors on human health and ecosystem integrity. NHEERL's research is used by EPA and other government agencies to identify and understand the processes that affect our health and environment. The research helps to evaluate the risks that pollution poses to humans and ecosystems.

www.epa.gov/nheerl

The National Risk Management Research Laboratory (NRMRL) conducts research on ways to prevent and reduce risks from pollution that threaten human health and the environment. NRMRL investigates methods to prevent and control pollution to air, land, and water, and to protect water quality in public water systems. NRMRL also assesses methods to clean up contaminated sites, sediments, and groundwater, prevent and control indoor air pollution, and restore ecosystems.

www.epa.gov/ORD/NRMRL

The National Center for Environmental Assessment (NCEA) is EPA's national resource center for human health and ecological risk assessment. NCEA develops new methods for risk assessment, and applies those methods to the cutting-edge issues that the Agency faces. NCEA functions as a critical link between researchers within ORD and EPA decision makers. As a result, NCEA plays an important role as a consultant to EPA programs and regions on the use of science in environmental decision making.
www.epa.gov/ncea

The National Center for Environmental Research (NCER) supports innovative environmental research by scientists in the academic community. NCER's Science to Achieve Results (STAR) program funds competitive research grants and graduate fellowships in numerous environmental science and engineering disciplines to complement ORD's in-house research. Through this same competitive process, NCER helps small businesses address critical technology needs through its Small Business Innovative Research (SBIR) program.
www.epa.gov/ncer

The National Homeland Security Research Center (NHSRC) manages, coordinates, and supports homeland security research and technical assistance efforts. This research develops the scientific foundations to prevent or manage threats. Efforts focus on developing methods to clean up contaminated buildings (the Safe Building Program), protecting the nation's drinking water supply (the Water Protection Program), and improving risk assessment techniques (the Rapid Risk Assessment Program).
www.epa.gov/ordnhsr

In addition, there are two offices that play a critical role in the work of ORD. They are the Office of Science Policy (OSP) and the Office of Resources Management Administration (ORMA). OSP is responsible for science integration, coordination, and communication in areas that include providing science support to EPA in the regulatory decision-making process and management of ORD's multi-year research planning. OSP also manages the ORD Regional Science Program, staffs the EPA Science Policy Council, and integrates tribal and environmental justice issues into ORD's decision-making process.
www.epa.gov/osp

The Office of Resources Management Administration (ORMA) ensures that ORD's laboratories and centers have the resources necessary to conduct world-class environmental research. ORMA provides management and administrative services and independently evaluates and measures progress in meeting ORD's strategic goals. ORMA also manages **www.epa.gov/ord** which is a useful portal for finding information about ORD and its products and research activities.



for more information
please visit our website:

www.epa.gov/ord

